REMARKS

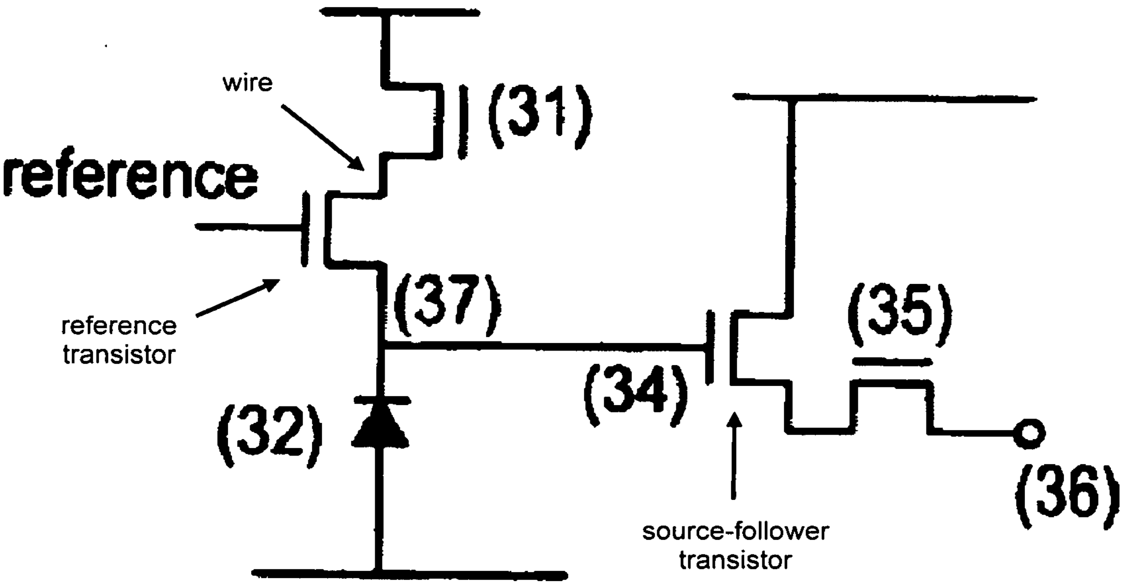
Claims 1-10 and 12-53 are pending. Claims 1, 8, 24, 28, 31, 33, 37, 39-43, 45-47, and 50-52 have been amended. Claim 11 has been cancelled. Applicants reserve the right to pursue the original and other claims in this any other application.

Claims 24-30 stand rejected under 35 U.S.C. § 112, first paragraph, as failing to comply with the written description requirement. Claims 24 and 28 have been amended to recite first and second photodiodes, as suggested by the Office Action. Claims 24-30 are supported by at least FIG. 6A and Paragraphs 0041 and 0042 of the specification. Therefore, the rejection of claims 24-30 should be withdrawn and the claims allowed.

Claims 1-5, 8-14, 16-18, and 31-36 stand rejected under 35 U.S.C. § 102(e) as being anticipated by Dierickx (U.S. Patent No. 7,106,373) ("Dierickx"). The rejection is respectfully traversed.

Claim 1 recites a method of operating a pixel circuit. The method comprises "turning on a transfer transistor to remove some of said accumulated photo-generated charge to a floating diffusion node ... and producing an output signal based at least in part on accumulated charges in the floating diffusion region...."

By contrast, Dierickx discloses a pixel circuit in which charge is removed from a charge storage node 37 associated with a photodiode 32 to a reset voltage line via a reset transistor 31 modulated by a reference voltage applied to a reference transistor between the photodiode and the reset transistor. (Dierickx, FIG. 3 and Column 6, Lines 51-64) Dierickx's FIG. 3 is reproduced below. Applicants have added reference labels to more clearly identify distinctions between the Dierickx circuit and Applicants' claimed invention.



Dierickx FIG. 3

The reference transistor cannot be properly characterized as a transfer transistor, as claimed by Applicants, because it does not selectively couple the photodiode 32 to the source follower transistor 34. In addition, the wire between the reference transistor and the reset transistor 31 cannot be properly characterized as a floating diffusion region, as claimed by Applicants, because it is merely a conductive wire rather than an implant region in a substrate. Even if the wire is characterized as a floating diffusion region, it is not located between the photodiode 32 and the source-follower transistor 34 and, therefore, the Dierickx pixel circuit cannot "produc[e] an output signal based at least in part on accumulated charges in the floating diffusion region," as claimed by Applicants. For at least these reasons, the rejection of claim 1 over Dierickx should be withdrawn and the claim allowed.

Claims 4-11 depend from claim 1 and are allowable along with claim 1 for at least the reasons stated above with respect to claim 1 and on their own merits. Therefore, the rejection of claim 4-11 should be withdrawn and the claims allowed.

Claim 12 recites similar limitations as claim 1 and is allowable over Dierickx for at least the reasons stated above with respect to claim 1. Therefore, the rejection of claim 12 should be withdrawn and the claim allowed. Claims 13, 14, and 16-18 depend from claim 12 and are allowable along with claim 12 for at least the reasons stated above with respect to claim 12 and on their own merits. Therefore, the rejection of claims 13, 14, and 16-18 should be withdrawn and the claims allowed.

Claim 31 recites similar limitations as claim 1 and is allowable for at least the reasons stated above with respect to claim 1. Therefore, the rejection of claim 31 should be withdrawn and the claim allowed. Claims 32-36 depend from claim 31 and are allowable along with claim 31 for at least the reasons stated above with respect to claim 31 and on their own merits. Therefore, the rejection of claims 32-36 should be withdrawn and the claims allowed.

Claims 6 and 7 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Dierickx in view of Ueno (U.S. Patent No. 6,342,920) ("Ueno"). The rejection is respectfully traversed.

Claims 6 and 7 depend from claim 1 and are allowable over Dierickx for at least the reasons stated above with respect to claim 1 and on their own merits. Ueno, which is cited as disclosing pulse width and pulse amplitude as signal characteristics, does not cure the failings of Dierickx. Therefore, the rejection of claims 6 and 7 should be withdrawn and the claims allowed.

Claim 15 stands rejected under 35 U.S.C. § 103(a) as being unpatentable over Dierickx. The rejection is respectfully traversed.

Claim 15 depends from claim 12 and is allowable along with claim 12 for at least the reasons stated above with respect to claim 12 and on its own merits. Therefore, the rejection of claim 15 should be withdrawn and the claim allowed.

Claims 19-23 and 37-42 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Pain et al. (U.S. Patent No. 7,002,626) ("Pain") in view of Dierickx. The rejection is respectfully traversed.

Claim 19 recites saturation control limitations similar to claim 1, but in a pixel circuit comprising an anti-blooming transistor. As the Office Action correctly acknowledges at page 10, Pain does not teach or suggest applying saturation control signals, as claimed by Applicants. Thus, the Office Action uses Pain in combination with Dierickx. However, for at least the reasons detailed above with respect to claim 1, Dierickx also fails to teach or suggest the method of claim 19. Moreover, the Pain pixel circuit is incompatible with, and therefore cannot be properly combined with, the Dierickx pixel circuit. The Pain pixel circuit relies on a transfer transistor to selectively couple photoactive regions to output regions. (Pain, Column 4, Lines 62-65) As detailed above, the Dierickx pixel circuit lacks a transfer transistor and is not compatible with the Pain circuit. For at least these reasons, the rejection of claim 19 should be withdrawn and the claim allowed.

Claims 20-23 depend from claim 19 and are allowable along with claim 19 for at least the reasons stated above with respect to claim 19 and on their own merits. Therefore, the rejection of claims 20-23 should be withdrawn and the claims allowed.

Claim 37 recites similar limitations as claim 19 and is allowable for at least the reasons stated above with respect to claim 19. Therefore, the rejection of claim 37 should be withdrawn and the claim allowed.

Claims 38-42 depend from claim 37 and are allowable along with claim 37 for at least the reasons stated above with respect to claim 37 and on their own merits. Therefore, the rejection of claims 38-42 should be withdrawn and the claims allowed.

Claims 24-30 and 43-53 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Kochi (U.S. Patent No. 9,947,088) ("Kochi") in view of Dierickx. The rejection is respectfully traversed.

Claim 24 recites saturation control limitations similar to claim 1, but in a pixel circuit comprising first and second photodiodes. As the Office Action correctly acknowledges at page 14, Kochi does not teach or suggest applying saturation control signals, as claimed by Applicants. Thus, the Office Action uses Kochi in combination with Dierickx. However, for at least the reasons detailed above with respect to claim 1, Dierickx also fails to teach or suggest the method of claim 24. Moreover, the Kochi pixel circuit is incompatible with, and therefore cannot be properly combined with, the Dierickx pixel circuit. The Kochi pixel circuit relies on multiple transfer transistors 5-1, 5-2 to selectively couple photodiodes 1-1, 1-2 to a source-follower transistor 2. (Kochi, FIG. 1) As detailed above, the Dierickx pixel circuit lacks a transfer transistor and is not compatible with the Kochi circuit. For at least these reasons, the rejection of claim 24 should be withdrawn and the claim allowed.

Claims 25-30 depend from claim 24 and are allowable along with claim 24 for at least the reasons stated above with respect to claim 24 and on their own merits. Therefore, the rejection of claims 25-30 should be withdrawn and the claims allowed.

Claim 43 recites similar limitations as claim 24 and is allowable for at least the reasons stated above with respect to claim 24. Therefore, the rejection of claim 43 should be withdrawn and the claim allowed.

Claims 44-53 depend from claim 43 and are allowable along with claim 43 for at least the reasons stated above with respect to claim 43 and on their own merits. Therefore, the rejection of claim 44-53 should be withdrawn and the claims allowed.

In view of the above, Applicants believe the pending application is in condition for allowance and respectfully requests that it be passed to issue.

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Respectfully submitted,

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